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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
TALBOT, BRIAN K	
ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/687,112	KIM, BIOH	
	Examiner	Art Unit	
	Brian K. Talbot	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 February 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26 and 42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26 and 42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/15/08 has been entered.

2. Claim 42 has been added. Claims 27-41 have been canceled. Claims 1-26 and 42 remain in the application.

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. In light of the amendment filed 2/15/08, the 35 USC 102 and 103 rejections have been withdrawn. However, the following rejection has been necessitated by the amendment.

Claim Rejections - 35 USC § 103

5. Claims 1-26 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over in Hur et al. (6,013,572) combination with Mitchell et al. (5,773,359) further in combination with Batinovich (2004/0040855).

Hur et al. (6,013,572) teaches a method of fabricating and testing silver-tin alloy solder bumps. A masked underbump metallurgy layer on a microelectronic substrate defining exposed portions of the underbump metallurgy layer is plated with silver, then plated with tin and then reflowed to form the silver-tin alloy bump (abstract and col. 1, line 55 – col. 2, line 12). The silver and tin layers are applied by electroplating (col. 2, lines 28-42). In another embodiment, two layers of silver and plated followed by a layer of tin and reflowing is performed (col. 2, lines 53-62). The first underbump metallurgy layer is Ti, Cr or TiW. The second underbump metallurgy layer is copper or nickel (col. 2, lines 19-27). The tin layer can comprise an alloy such as silver-tin (col. 3, lines 1-3). The first underbump layer is considered a barrier layer by the Examiner as it comprises Cr, Ti or TiW which are conventional barrier/diffusion layers in the art.

Hur et al. (6,013,572) fails to teach forming a diffusion barrier layer on the UBM layer underneath the solder material.

Mitchell et al. (5,773,359) teaches an interconnect system and method of fabricating a solder bump is formed on a semiconductor substrate whereby UBM is formed as a tri-layer comprising a bottom barrier layer (26) and two copper layer (27,28). The barrier layer (26) is preferable titanium but other materials can be used including nickel. The barrier layer (26) functions to prevent diffusion of the copper and/or solder layer from penetrating the metal layer (23) on the substrate. In addition, the solder layer (29) comprises tin and lead but the lead can be replaced by bismuth or indium. The solder layer (29) can be applied by electroplating (col. 1, line 48 – col. 3, line 55).

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified Hur et al. (6,013,572) solder bump process by incorporating a barrier/diffusion layer above the UBM layer and beneath the solder material as evidenced by Mitchell et al. (5,773,359) with the benefits associated with such a layer as detailed above.

Hur et al. (6,013,572) in combination with Mitchell et al. (5,773,359) fail to teach the UBM layer comprising a barrier layer and a seed layer.

Batinovich (2004/0040855) teaches a method for low-cost underbump metallization for flip chip and BGA's. Batinovich (2004/0040855) teaches a UBM comprising an adhesion/barrier layer of titanium/tungsten alloy and a wettable layer comprising copper or nickel. Batinovich (2004/0040855) further teaches that a seed layer can be applied between the adhesion/barrier layer and wettable layer ([0032] and Figs. 1a-1d).

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified Hur et al. (6,013,572) in combination with Mitchell et al. (5,773,359) UBM layer to include a adhesion/barrier layer and seed layer as evidenced by Batinovich (2004/0040855) with the expectation of achieving similar success.

Response to Amendment

6. Applicant's arguments filed 2/15/08 have been fully considered but they are not persuasive.

Applicant argued that the Hur et al. (6,013,572) in combination with Mitchell et al. (5,773,359) fails to teach a UBM layer comprising a barrier layer and a seed layer.

Batinovich (2004/0040855) teaches this limitation as noted above.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian K. Talbot whose telephone number is (571) 272-1428. The examiner can normally be reached on Monday-Friday 8AM-4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

//Brian K Talbot//
Primary Examiner, Art Unit 1792

BKT